Bellevue-Omaha Data Center
1001 North Fort Crook Rd.
Bellevue, NE 68114

Midlands-Omaha Data Center
11425 South 84th Street
Papillion, NE 68046

Lenexa Data Center
14500 West 105th Street
Lenexa, KS 66215

Kansas City Data Center
10801 N. Amity Avenue
Kansas City, MO 64153

Tierpoint Sioux Falls
700 East 54th St North, Suite 200
Sioux Falls, SD 57104

Sioux Falls West Data Center
5300 North La Mesa Drive
Sioux Falls, SD 57107

Saint Louis Olive Data Center
1111 Olive St
Saint Louis, MO 63101

Saint Louis Walnut Data Center
900 Walnut St
Saint Louis, MO 63102

Bellevue-Omaha Data Center

- ✓ **Security:** The human element of data center management is our focus: planning, staffing, and support available 24/7.
- ✓ **Capacity:** The most efficient data centers are operating near 100% capacity. For that reason we build in capacity as needed.
- ✓ **Reliability:** Real-time monitoring systems provide feedback data to building operators and generate self-diagnosis reports.
- ✓ **Flexibility:** Spaces and systems can be reconfigured as needed to meet capacity needs with continuing reliability.

Bellevue-Omaha Data Center Features

The Bellevue-Omaha Data Center is built to meet client needs while keeping rates affordable for enterprise clients. With reinforced concrete construction, security with biometric scanners and N+1 power; Bellevue-Omaha Data Center is reliable, secure and ready to keep you up and running constantly and consistently.

The facility also maintains redundant heating, cooling and connectivity as well as water detection throughout. And, with Tierpoint's network of compliant-ready colocation facilities, we are able to provide you with almost failsafe reliability.

And though the industry generally uses simplified descriptions or certifications to compare one data center's reliability and redundancy to another, we do more.

Tierpoint acknowledges that security and flexibility are two additional critical components that compliment reliability and redundancy.

Redundancy and reliability are built into our data centers at the system level, equipment and component level, providing additional cooling capacity and infrastructure backup telecom and electrical services. Our highly engineered designs are operated by trained facilities staff 24/7.

Our data centers are designed using ANSI/TIA-942-A resiliancy tiers. Each metric is addressed on an individual level both during design and operation. These metrics are summaized on the following sheets.

Features

- Data Center Suite Compartimentalization
- 20,000 ft^2 total raised floor space
- 6,000 watts/cabinet power density
- Maintenance corridors for fire suppression, telecommunications & air handling equipment.
- Low electrical rates rank 20^{th} in the country[1]

Architectural

- Total vertical space: 20 ft.
- 10 ft clear (floor tile to ceiling tile) in data suite.
- 3 ft raised floor for power & cooling distribution
- 6 ft return air plenum with server chimneys
- 6 Separate data suites

Mechanical

- N+1 Mechanical system redundancy
- FM-200 clean agent fire suppression system for data suites & critical electrical and telecommunications rooms

Building Security

- Central security office within hardened shell
- 24/7 staffing and monitoring of CCTV
- Badge or escort required for access
- Mantrap plus badge & biometric scanners
- All entries are logged/recorded

Telecommunications

- 24/7 help desk with redundant connectivity
- On-site support
- 2N+1 Internet connection
- Connectivity to multiple Telecom providers

Electrical

- Dual power feed from local utility, one feed reserved with an automatic throw-over switch
- Dedicated utility transformer for 3 UPS systems (4^{th} is served by common building transformer)
- Dedicated generator for each UPS system
- Catcher bus configuration with UPS and

[1] Via U.S. Energy Information Administration, updated as of November 20, 2013 monthly report.

Bellevue-Omaha Data Center Features

- 6 CRAC units per data center suite (160 tons) with underfloor cooling distribution to aisles
- Dehumidification and reheat at each unit
- Air-cooled condensing units located on roof
- Underfloor leak detection in data suites
- Pumped AC condensate with redundant sump pumps and indirect drain connection
- generator redundancy
- 2 Simultaneously active power distribution paths to static switch PDU's.
- N+1 generator design
- N+1 UPS design for backup power
- Power distribution within 50’ of critical load & branch circuit monitoring
- Redundant power feeds to each cabinet

About Tierpoint

Tierpoint is home to the largest and most prestigious network of data centers in the Midwestern region, with 8 high quality data centers in 4 states. Whether your needs revolve around compliance, cloud computing, security, reliability, or affordability, our network of data centers provide solutions that fit any enterprise need. Additionally, our data centers are monitored 24/7 by our network operations center, an experienced team that works around the clock to assure reliability and support, no matter the time or the place.

To learn more about how we can help your business, contact us at 1.866.500.7661 or www.Tierpoint.com

Infrastructure to keep your data secure.

Bellevue-Omaha Data Center Features

Tier 1: Basic Capacity
"Need only" (N). Susceptible to disruptions from both planned and unplanned activity. If it has UPS or generators, they are single-module systems and have many single points of failure.

Tier 2: Redundant Components
Facilities with redundant components are slightly less susceptible to disruptions from both planned and unplanned activity than a basic data center. They have UPS, and engine generators, but their capacity design is "Need plus One" (N+1), which has a single-threaded distribution path throughout.

Tier 3: Concurrently Maintainable
Allows for any planned site infrastructure activity without disrupting computer hardware operation in any way. Unplanned activities such as errors in operation or spontaneous failures of facility infrastructure components may still cause a data center disruption.

Tier 4: Fault Tolerant
Provides site infrastructure capacity and capability to permit any planned activity without disruption to the critical load. Fault-tolerant functionality also provides the ability of the site infrastructure to sustain at least one worst-case unplanned failure or event with no critical load impact.

Concurrent maintainability and testing capability
The facilities should be capable of being maintained, upgraded, and tested without interruption of operations.

Capacity and scalability
Data centers and support infrastructure should be designed to accommodate future growth with little or no disruption to services.

Isolation
Data centers should be (where practical) used solely for the purposes for which they were intended and should be isolated from non-essential operations.

N Base Requirement
System meets base requirements and has no redundancy.

N+ 1 Redundancy
Provides one additional unit, module, path, or system in addition to the minimum required to satisfy the base requirement. The failure or maintenance of any single unit, module, or path will not disrupt operations.

N+2 Redundancy
Provides two additional units, modules, paths, or systems in addition to the minimum required to satisfy the base requirement. The failure or maintenance of any two single units, modules, or paths will not disrupt operations.

2N redundancy
Provides two complete units, modules, paths, or systems for every one required for a base system. Failure or maintenance of one entire unit, module, path, or system will not disrupt operations.

2(N+1) Redundancy
Provides two complete (N+1) units, modules, paths, or systems. Even in the event of failure or maintenance of one unit, module, path, or system, some redundancy will be provided and operations will not be disrupted.

Infrastructure to keep your data secure.

Bellevue-Omaha Data Center Features

AHJ – authority having jurisdiction
ANSI – American National Standards Institute
ASHRAE – American Society of Heating, Refrigerating, and Air-Conditioning Engineers
ASTS – automatic static transfer switch
ATO – automatic throw over
ATS – automatic transfer switch
BNC – bayonet Neill-Concelman
CCTV – closed-circuit television
CER – common equipment room
CFD – computational fluid dynamics
CP – consolidation point
CPU – central processing unit
CRAC – computer room air conditioning
CSA – Canadian Standards Association International
DSX – digital signal cross-connect
ECA – Electronic Components Association
EDA – equipment distribution area
EIA – Electronic Industries Alliance (Note: ceased operation 12/31/10. EIA standards are managed by ECA)
EMI – electromagnetic interference
EMS – energy management system
EMT – electrical metallic tubing
ENT – electrical non-metallic tubing
ENI – external network interface
EO – equipment outlet
HC – horizontal cross-connect
HDA – horizontal distribution area
HVAC – heating, ventilation and air conditioning
IC – intermediate cross-connect
IDA– intermediate distribution area
IDC – insulation displacement contact
KVM – keyboard, video, mouse
LAN – local area network
LFMC – liquid tight flexible metallic conduit
LFNC – liquid tight flexible non-metallic conduit
MC – main cross-connect
MDA – main distribution area
NEC® – National Electrical Code®
NEMA – National Electrical Manufacturers Association
NFPA – National Fire Protection Association
PAC – precision air conditioner
PEMCS – power and environmental monitoring and control system
PBX – private branch exchange
PDU – power distribution unit
RFI – radio frequency interference
SAN – storage area network
SDH – synchronous digital hierarchy
SONET – synchronous optical network
STM – synchronous transport model
TIA – Telecommunications Industry Association
TNC – threaded Neill-Concelman
TR – telecommunications room
UL – Underwriters Laboratories Inc
UPS – uninterruptible power supply
WAN – wide area network
ZDA – zone distribution area

* refer to Section 3 of ANSI/TIA-942-A for full definitions of terms

Infrastructure to keep your data secure.

Bellevue-Omaha Data Center Features

The tables below compares **Bellevue-Omaha Data Center** to ANSI/TIA-942-A Informative Annex F – Data Center Infrastructure Tiers. The four tiers relate to various levels of resiliency of the data center facility infrastructure (higher tiers correspond to higher resiliency).

Telecommunications

Tier 4 Telecommunications facilities include redundant data center backbone cabline and distributor locations. Cabling between spaces follows physically separate routes, with common paths only inside end spaces. Backbone cabling is protected by routing through conduit or by use of cables with interlocking armor. Automatic backup takes place for all critical telecommunications equipment, access provider provisioning equipment, core layer production routers and core layer production LAN/SAN switches. Sessions and connections switch automatically to the backup equipment.

Redundant Main Distribution Areas (MDAs) are located at opposite ends of the data center. Fire protection zones, power distribution units and air conditioning equipment are not shared between the redundant MDAs. Separate pathways are provided from each MDA to each entrance room with an additional pathway between the MDAs. Redundant routers and switches are distributed bewteen redundant distribution spaces and each HAD is provided with connectivity to 2 different IDAs or MDAs. Each IDA is provided with connectivity to both MDAs.

Telecommunications	T_1	T_2	T_3	T_4
Cabling, racks, cabinets, & pathways compliant with relevant TIA specifications				✓
Diversely routed access provider entrances and maintenance holes with minimum 20 m separation				✓
Redundant access provider services - multiple access providers, central offices, access provider right-of-ways				✓
Redundant entrance room.				✓
Redundant main distribution area				✓
Redundant intermediate distribution areas (if present)				✓
Redundant backbone cabling and pathways				✓
Redundant horizontal cabling and pathways				✓
Routers and switches have redundant power supplies, processors				✓
Redundant routers and switches with redundant uplinks				✓
Patch panels, outlets, and cabling to be labeled per ANSI/TIA-606-B. Cabinets and racks to be labeled on front and rear.				✓
Patch cords and jumpers to be labeled on both ends with the name of the connection at both ends of the cable.				✓
Patch panel and patch cable documentation compliant with ANSI/TIA/EIA-606-B.				✓

Bellevue-Omaha Data Center Features

Architectural

Tier 1 Architectural systems do not include protection against physical events, intentional or accidental, natural or man-made, which could cause the data center to fail.
Tier 2 installations include additional minimal protections against some physical events.
Tier 3 protects against most physical events.
Tier 4 installations have considered all potential physical events that could cause the data center to fail. A Tier 4 Architectural data center design has provided specific and in some cases redundant protections again such events. Tier 4 data centers consider the potential problems with natural disasters such as seismic events, floods, fire, hurricanes and storms as well as potential problems with terrorism and disgruntled employees.

Site Selection:	**A1**	**A2**	**A3**	**A4**
Proximity to flood hazard area: Not within 100-year flood hazard area or less than 91 m / 100 yards from 50-year flood hazard area			✓	
Proximity to waterways (either coastal or inland): Not less than 0.8 km / 0.5 miles			✓	
Proximity to major traffic arteries and main rail lines: Not less than 0.8 km / 0.5 miles				✓
Proximity to major airports: Not less than 8 km / 5 miles or greater than 30 miles				✓
Parking:	**A1**	**A2**	**A3**	**A4**
Separate visitor and employee parking areas		✓		
Proximity of visitor parking to data center perimeter walls: <30 ft			✓	
		✓		
Multi-tenant occupancy within building: Allowed only if occupancies are non-hazardous		✓		
Building Construction:	**A1**	**A2**	**A3**	**A4**
Type of construction (IBC 2006): no Type			✓	
Fire resistive requirements:	**A1**	**A2**	**A3**	**A4**
Exterior bearing walls: 1 hour min.			✓	
Interior bearing walls: no rating		✓		
Exterior nonbearing walls: no rating		✓		
Structural frame: 1 hour min.			✓	

Bellevue-Omaha Data Center Features

Interior non-computer room partition walls: no rating		✓		
Interior computer room partition walls: 1 hour min.			✓	
Shaft enclosures: no rating		✓		
Floor and floor-ceilings: no rating		✓		
Roofs and roof-ceilings: 1 hour min.			✓	
Meet requirements of NFPA 75: no rating				
Miscellaneous Building Components:	**A1**	**A2**	**A3**	**A4**
Vapor barriers for walls and ceiling of computer room				✓
Multiple building entrances with security checkpoints				✓
Access floor panel construction (when provided)				✓
Understructure (when access floor is provided)				✓
Ceilings within computer room areas:	**A1**	**A2**	**A3**	**A4**
Ceiling height: 3.6 m (12.0 ft) minimum (not less than 600 mm (24 in) above tallest piece of equipment				
Roofing:	**A1**	**A2**	**A3**	**A4**
Class A		✓		
Type: non-combustible deck with mechanically attached systems			✓	
Wind uplift resistance: FM 1-90			✓	
Roof Slope: N/A				
Doors and windows:	**A1**	**A2**	**A3**	**A4**
Fire rating: not less than 3/4 hr at computer room			✓	
Door size: Not less than 1.2 m (4 ft) wide and not less than 2.49 m (8 ft) high				✓
No exterior windows on perimeter of computer room				✓
Construction provides protection against electromagnetic radiation: no				
Entry Lobby:	**A1**	**A2**	**A3**	**A4**
Physically separate from other areas of data center				✓

Bellevue-Omaha Data Center Features

Fire separation from other areas of data center			✓	
Security counter: yes (physically separated from other areas of the data center)				✓
Single person interlock, portal or other hardware designed to prevent piggybacking or passback				✓
Administrative Offices:	**A1**	**A2**	**A3**	**A4**
Physically separate from other areas of data cent				✓
Fire separation from other areas of data center: not less than 1 hr.			✓	
Security office:	**A1**	**A2**	**A3**	**A4**
Physically separate from other areas of data center				✓
Fire separation from other areas of data center: not less than 1 hr.			✓	
180-degree peepholes on security equipment and monitoring rooms				✓
Dedicated and hardened security equipment and monitoring rooms: yes, with 16 mm (5/8 in) plywood lined walls and solid core door				✓
Operations Center:	**A1**	**A2**	**A3**	**A4**
Operations Center physically separate from other areas of data center: yes, with a backup service/facility in a separate address				✓
Fire separation from other non-computer room areas of data center: no rating			✓	
Proximity to computer room: not directly or indirectly accessible			✓	
Restrooms and break room areas:	**A1**	**A2**	**A3**	**A4**
Proximity to computer room and support areas: immediately adjacent and provided with leak prevention barrier			✓	
Fire separation from computer room and support areas: N/A				
UPS and Battery Rooms:	**A1**	**A2**	**A3**	**A4**
Aisle widths for maintenance, repair, or equipment removal: Not less than 1.2 m (4 ft) clear				✓
Proximity to computer room: Immediately adjacent				✓
Fire separation from computer room and other areas of data center: not less than 1 hr.			✓	
Required Exit Corridors:	**A1**	**A2**	**A3**	**A4**
Fire separation from computer room and support areas: not less than 1 hr.			✓	

Bellevue-Omaha Data Center Features

Width: Not less than 1.5 m (5 ft) clear				✓
Shipping and receiving area:	**A1**	**A2**	**A3**	**A4**
Shipping and receiving area physically separate from other areas of data center				✓
Fire separation from other areas of data center: 1 hour min.			✓	
Physical protection of walls exposed to lifting equipment traffic: steel bollards or similar protection				✓
Number of loading docks: 1 per 2,500 m2 (25,000 ft2) of computer room (2 minimum)				✓
Generator and fuel storage areas:	**A1**	**A2**	**A3**	**A4**
Proximity to computer room and support areas: Separate building or exterior weatherproof enclosures with Code required building separation				✓
Proximity to publicly accessible areas: < 30 ft separation			✓	
Security:	**A1**	**A2**	**A3**	**A4**
System CPU UPS capacity: Building			✓	
Data Gathering Panels (Field Panels) UPS Capacity: Building + Battery (4 hour min)			✓	
Field Device UPS Capacity: Building + Battery (4 hour min)			✓	
Physical security staffing: 7 days a week, 24 hours a day with sufficient spare personnel to allow for physical inspections, walk alongs, supervisions etc				✓
Security Access Control/Monitoring at:	**A1**	**A2**	**A3**	**A4**
Generators: card access				✓
UPS, Telephone & MEP Rooms: card access				✓
Fiber Vaults: card access				✓
Emergency Exit Doors: delay egress per code				✓
Accessible Exterior Windows/openings: intrusion detection				✓
Security Operations Center: card access				✓
Network Operations Center: card access				✓
Security Equipment Rooms: card access				✓
Doors into Computer Rooms: card or biometric access for ingress, not egress			✓	

Bellevue-Omaha Data Center Features

Perimeter building doors: card access all entrances				✓
Main door onto computer room floor: card access			✓	
Bullet resistant walls, windows & doors	**A1**	**A2**	**A3**	**A4**
Security Counter in Lobby: Level 3 (min)				✓
CCTV Monitoring	**A1**	**A2**	**A3**	**A4**
Building perimeter and parking				✓
Generators				✓
Access Controlled Doors				✓
Computer Room Floors				✓
UPS, Telephone & MEP Rooms				✓
CCTV	**A1**	**A2**	**A3**	**A4**
CCTV Recording of all activity on all cameras: digital				✓
Recording rate (frames per second): 20 frames/sec (min)				✓
Structural	**A1**	**A2**	**A3**	**A4**
Facility design to International Building Code (IBC) Seismic Design Category (SDC) requirements: N/A			✓	
Site Specific Response Spectra - Degree of local Seismic accelerations: N/A		✓		
Importance factor - assists to ensure greater than code design: I=1			✓	
Telecommunications equipment racks/cabinets anchored to base or supported at top and base: base only		✓		
Deflection limitation on telecommunications equipment within limits acceptable by the electrical attachments				✓
Bracing of electrical conduits runs and cable trays				✓
Bracing of mechanical system major duct runs				✓
Floor loading capacity superimposed live load: 7.2 kPa (150 lbf/ft2)		✓		
Floor hanging capacity for ancillary loads suspended from below		✓		
Concrete Slab Thickness at ground				✓

Bellevue-Omaha Data Center Features

Minimum concrete topping over flutes for equipment anchorage when concrete filled metal deck structure used for elevated floors				✓
Building LFRS (Shearwall/Braced Frame/Moment Frame) indicates displacement of structure: Steel/Concrete Moment Frame		✓		
Building Energy Dissipation - Passive Dampers/Base Isolation (energy absorption): N/A		✓		
Elevated floor construction: PT concrete		✓		

Bellevue-Omaha Data Center Features

Electrical

Each subsequent tier listed below should also meet the requirements of the previous tier(s).

A **Tier 2** electrical facility provides N+1 redundant UPS modules. A generator system sized to handle all data center loads is required. Provisions to connect portable load banks should be provided for generator and UPS testing. Power distribution units (PDUs) should be used to distribute power to the critical electronic loads. Color-coding of nameplates and feeder cables to differentiate A and B distribution should be considered. A circuit should not serve more than one rack to prevent a circuit fault from affecting more than one rack. To provide redundancy, racks and cabinets should each have two dedicated electrical circuits fed from two different Power Distribution Units (PDUs) or electrical panels. Each receptacle should be identified with the PDU and circuit number, which serves it. Redundant feeder to mechanical system distribution board is recommended but not required.

A **Tier 3** facility should be provided with at least N+1 redundancy at the module, pathway, and system level, including the generator and UPS systems, the distribution system, and all distribution feeders. The configuration of mechanical systems should be considered to ensure that N+1 redundancy is provided in the combined electrical-mechanical system. Feeders and distribution boards are dual path, whereby a failure of or maintenance to a cable or panel will not cause interruption of operations. Sufficient redundancy should be provided to enable isolation of any item of mechanical or electrical equipment as required for essential maintenance without affecting the services being provided with cooling. By employing a distributed redundant configuration, single points of failure are virtually eliminated from the utility service entrance down to the mechanical equipment, and down to the PDU or computer equipment.

To increase the availability of power to the critical load, the distribution system is configured in a distributed isolated redundant (dual path) topology. This topology requires the use of automatic static transfer switches (ASTS) placed either on the primary or secondary side of the PDU transformer. For dual cord (or more) load design, affording continuous operation with only one cord energized, no automatic static transfer switches (ASTS) is used, provided the cords are fed from different UPS sources. The automatic static transfer switches (ASTS) will have a bypass circuit and a single output circuit breaker.

A central power and environmental monitoring and control system (PEMCS) should be provided to monitor all major electrical equipment and a separate programmable logic control system should be provided, programmed to manage the mechanical system, optimize efficiency, cycle usage of equipment and indicate alarm condition.

Tier 4 installations should be designed in a '2(N+1)' configuration in all modules, systems, and pathways. All feeders and equipment should be capable of manual bypass for maintenance or in the event of failure. Any failure will automatically transfer power to critical load from failed system to alternate system without disruption of power to the critical electronic loads. A battery monitoring system capable of individually monitoring the impedance or resistance of each cell and temperature of each battery jar and alarming on impending battery failure should be provided to ensure adequate battery operation.

The utility service entrances should be dedicated to the data center and isolated from all noncritical facilities. The building should have at least two utility feeders from different utility substations for redundancy.

Bellevue-Omaha Data Center Features

General:	**E1**	**E2**	**E3**	**E4**
System allows concurrent maintenance: Throughout Distribution System				✓
No single points of failure for distribution systems serving electrical equipment or essential loads				✓
Power System Analysis: Up-to-date short circuit study, coordination study, arc flash analysis, and load flow study				✓
Computer & Telecommunications Equipment Power Cords: Single Cord Feed with 100% capacity				✓
Utility	**E1**	**E2**	**E3**	**E4**
Utility Entrance: N+1 Redundant Feed (catcher bus topology)			✓	
Main Utility Switchboard:	**E1**	**E2**	**E3**	**E4**
Service: Dedicated				✓
Construction: Switchboard with draw out circuit breakers				✓
Surge Suppression: yes				✓
Uninterruptible Power Supply System:	**E1**	**E2**	**E3**	**E4**
Redundancy: N+1 (catcher bus topology)			✓	
Topology: Single or Parallel Modules			✓	
Automatic Bypass: Yes, with dedicated feeder to automatic bypass				✓
Maintenance Bypass Arrangement: Dedicated maintenance bypass feeder serving UPS output switchboard				✓
Output Power Distribution: Switchboard incorporating removable circuit breaker with adjustable long time and instantaneous trip function w/o provision to turn off instantaneous function.			✓	
Battery String: Dedicated String for each module				✓
Battery Type: 10 Year valve regulated lead acid or flooded type or flywheel		✓		
Battery minimum back up time with design load at end of battery life: 7 minutes		✓		
Battery Monitoring System: Centralized automated system to check each cell for, voltage, and impedance or resistance				✓
Power Distribution Unit:	**E1**	**E2**	**E3**	**E4**
Transformer: Standard high efficiency			✓	

Bellevue-Omaha Data Center Features

Automatic Static Transfer Switch:	**E1**	**E2**	**E3**	**E4**
Over-current Device: Circuit Breaker				✓
Maintenance Bypass Procedure: Manual Guided with mechanical interlock			✓	
Output: Dual Circuit Breaker				✓
Grounding:	**E1**	**E2**	**E3**	**E4**
Lightning protection system				✓
Lighting fixtures neutral isolated from service entrance derived from lightning transformer for ground fault isolation				✓
Data center grounding infrastructure in computer room				✓
Computer Room Emergency Power Off (EPO) System:	**E1**	**E2**	**E3**	**E4**
Installation: push to activate with cover guard and warning label				✓
Test Mode				✓
Alarm				✓
Abort Switch				✓
Central Power Monitoring:	**E1**	**E2**	**E3**	**E4**
Monitored Points: Utility, Main Transformer, UPS, Generator, Feeder Circuit Breakers, Automatic Static Transfer Switch, PDU, Automatic Transfer Switches, Surge Protection Device, Critical Load Branch Circuits				✓
Notification Method: Control Room Console, Pager, Email, and/or text message to multiple facility personnel				✓
Battery Room:	**E1**	**E2**	**E3**	**E4**
Separate from UPS/Switchgear Equipment Rooms				✓
Individual Battery Strings Isolated from Each Other				✓
Shatterproof Viewing Glass in Battery Room Door: no			✓	
Standby Generating System:	**E1**	**E2**	**E3**	**E4**
Generator Sizing: Sized for total building load N+1 distributed redundancy (catcher bus topology)			✓	
Generators not on Single Bus				✓

Bellevue-Omaha Data Center Features

Loadbank:	**E1**	**E2**	**E3**	**E4**
Installation: Provision for Portable				✓
Equipment Tested: Generator, UPS				✓
Auto Shutdown: Automatic upon failure of utility				✓
Testing:	**E1**	**E2**	**E3**	**E4**
Factory Acceptance Testing: UPS and Generator Systems, Generator controls, ASTS				✓
Site circuit breaker testing: Primary Injection and Contact Resistance test of all circuit breakers in critical and essential paths, 225 A and higher				✓
Commissioning: Component Level, system level, and integrated system including total outage testing				✓
Equipment Maintenance:	**E1**	**E2**	**E3**	**E4**
Operation and Maintenance Staff: Onsite 24/7				✓
Preventative Maintenance: Comprehensive preventative maintenance program				✓
Facility Training Programs: Comprehensive training program for normal operation of equipment and manual operation of equipment during emergency operation				✓

Bellevue-Omaha Data Center Features

Mechanical

Each subsequent tier listed below should also meet the requirements of the previous tier(s).

Tier 1 HVAC systems include single or multiple air conditioning units with cooling capacity to maintain critical space temperature and relative humidity at design conditions with no redundant units. If air conditioning units are served by a water-side heat rejection system, such as a chilled water or condenser water system, the components of these systems are likewise sized to maintain design conditions, with no redundant units. The piping system or systems are single path, whereby a failure of or maintenance to a section of pipe will cause partial or total interruption of the air conditioning system. If a generator is provided, all air-conditioning equipment should be powered by the standby generator system.

The HVAC system of a **Tier 2** facility includes multiple air conditioning units with the combined cooling capacity to maintain critical space temperature and relative humidity at design conditions, with one redundant unit (N+1). If these air conditioning units are served by a water system, the components of these systems are likewise sized to maintain design conditions, with one redundant unit(s). Air-conditioning systems should be designed for continuous operation 7 days/24 hours/365 days/year, and incorporate a minimum of N+1 redundancy in the Computer Room Air Conditioning (CRAC) units, with a minimum of one redundant unit for every three or four required units. Power circuits to the air-conditioning equipment should be distributed among a number of power panels/distribution boards to minimize the effects of electrical system failures on the air conditioning system. All temperature control systems should be powered through redundant dedicated circuits from the UPS. The required cooling capacity should be calculated based on the kW (not kVA) supply available from the UPS system. Redundancy and isolation should be provided in the fuel storage system to ensure that fuel system contamination or a mechanical fuel system failure does not affect the entire generator system.

The HVAC system of a **Tier 3** facility includes multiple air conditioning units with the combined cooling capacity to maintain critical space temperature and relative humidity at design conditions, with sufficient redundant units to allow failure of or service to one electrical switchboard. If these air conditioning units are served by a water-side heat rejection system, such as a chilled water or condenser water system, the components of these systems are likewise sized to maintain design conditions, with one electrical switchboard removed from service. The piping system or systems are dual path, whereby a failure of or maintenance to a section of pipe will not cause interruption of the air conditioning system. Redundant computer room air conditioning (CRAC) units should be served from separate panels to provide electrical redundancy. All computer room air conditioners (CRAC) units should be backed up by generator power.
Refrigeration equipment with N+1, N+2, 2N, or 2(N+1) redundancy should be dedicated to the data center. Sufficient redundancy should be provided to enable isolation of any item of equipment as required for essential maintenance without affecting the services being provided with cooling.

If chilled water or water-cooled systems are used, each data center dedicated sub-circuit should have independent pumps supplied from a central water ring circuit. A water loop should be located at the perimeter of the data center and be located in a sub floor trough to contain water leaks to the trough area. Leak detection sensors should be installed in the trough. Consideration should be given to fully isolated and redundant chilled water loops.

The HVAC system of a **Tier 4** facility considers alterative resources of water storage when evaporative systems are in place for a Tier 4 system and protects critical equipment against extended loss of cooling as well as full dual-path water systems.

Bellevue-Omaha Data Center Features

General:	**M1**	**M2**	**M3**	**M4**
Redundancy for mechanical equipment (e.g. air conditioning units, coolers, pumps, cooling towers, condensers): N+1 redundancy for mechanical equipment. Temporary loss of electrical power will not cause loss of cooling, but may cause temperature to elevate within operational range of critical equipment			✓	
No routing of water or drain piping not associated with the data center equipment in data center spaces				✓
Positive pressure in computer room and associated spaces relative to outdoors and non-data center spaces				✓
Floor drains in computer room for condensate drain water, humidifier flush water, and sprinkler discharge water				✓
Mechanical systems on standby generator				✓
HVAC Control System:	**M1**	**M2**	**M3**	**M4**
HVAC Control System: Control system failure will not interrupt cooling to critical areas				✓
Power Source to HVAC Control System: Redundant, UPS electrical power to BMS Control				✓
Fuel-Oil System:	**M1**	**M2**	**M3**	**M4**
Bulk Storage Tanks: Single tank (one per generator)		✓		
Storage Tank Pumps and Piping: Single pump and/or supply pipe			✓	
Fire Suppression:	**M1**	**M2**	**M3**	**M4**
Fire detection system				✓
Fire sprinkler system: pre-action (when required): N/A				✓
Gaseous suppression system: clean agents listed in NFPA 2001				✓
Early Warning Smoke Detection System: no requirement above AHJ				
Water Leak Detection System				✓